

fits the lining bushing. This lessens the amount of surface which has to be ground, and, at the same time, makes it easier to insert the bushing, giving it, so to say, a point, which will first enter the lining bushing, and it interferes in no way with the proper qualities of the bushing as a guide for the cutting tool.

In some cases, the holes in the piece to be drilled are so close to one another that it is impossible to find space for lining bushings in the jig. If this happens, it is necessary to make a leaf, or a loose wall, or the whole jig, of machine steel or tool steel, hardening a portion or the whole jig thus made.

Table V. Allowances for
Grinding and Lapping Bushings

| Operatio n | Diameter of Bushings in Inches | | | | | |
|---------------|--------------------------------|----------|------------|--------------|------------|--------------|
| | <i>tt</i> | <i>i</i> | <i>iMJ</i> | ² | <i>art</i> | ³ |
| A | 0.008 | 0.010 | 0.013 | 0.016 | 0.020 | 0.025 |
| B | 0.0005 | 0.0005 | 0.007 | 0. | 0.0000 | 0.001 |
| C | 0.008 | 0.010 | 0.013 | 0.016 | 0.020 | 0.025 |
| D | 0.0003 | 0.0005 | 0.013 | 0.008 | 0.0009 | 0.001 |

A—Grind outside; B—Lap outside after grinding; C—Grind inside; D—Lap inside after grinding.

Methods of Making Jig Bushings. — There are several methods followed in turning jig bushings. Some toolmakers prefer to "chuck out" the hole to the desired size and then finish the outside of the bushing by placing it on an arbor; others prefer to turn up the bushings two at a time, end to end, cut them apart, and then bore as the final operation. This is an excellent method to follow

when making large bushings. The most rapid method, however, is to chuck out the hole and finish the outside at one setting, using bar stock held in the chuck of a rigid engine lathe. This method is not always practicable on large bushings.

In making allowances for grinding and lapping, many tool-makers use too small limits, which is the cause of many bushings having to be made over again on account of not "finishing out." On the other hand, many toolmakers leave too liberal an allowance for finishing, thereby causing unnecessary trouble